

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

Irrigation System

Trickle

(Number and Acre)

Code 441

DEFINITION

A planned irrigation system in which all necessary facilities are installed for efficiently applying water directly to the root zone of plants by means of applicators (orifices, emitters, porous tubing, perforated pipe) operated under low pressure. The applicators can be placed on or below the surface of the ground.

PURPOSES

To efficiently apply water directly to the plant root zone to maintain soil moisture within the range for good plant growth and without excessive water loss, erosion, reduction in water quality, or salt accumulation.

CONDITIONS WHERE PRACTICE APPLIES

Trickle irrigation plans shall be based on an evaluation of the site and the expected operating conditions. The soils and topography shall be suitable for irrigation of the proposed crops.

The water supply must be sufficient in quantity and quality for the crops to be grown. The trickle method of irrigation is suited to most orchard crops and row crops, to steep slopes where other methods would cause excessive erosion, to areas where application devices

interfere with cultural operations and to most climatic conditions where irrigated agriculture is feasible. This method is also suitable for irrigation of gardens, flowers, and shrubs in urban settings. Small flow rates of water can be used efficiently.

CRITERIA

Depth of application. The net depth of application shall be sufficient to replace the water used by the crop during the peak use period or critical growth stage without depleting the soil moisture in the root zone of the crop below the minimum level established for optimum growth. The gross depth shall be determined by using field application efficiencies consistent with the conservation use of water resources and shall include water required for leaching to maintain a steady state salt balance. The net depth of application shall be expressed as inches per day unit of design area.

$$F_n = 1.604 \frac{QNTE}{AF}$$

Where:

F_n = net application depth, in./day
 Q = discharge rate, gal./hr./emitter
 N = number of orifices or emitters
 T = hours of operation per day

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

- E = field application efficiency, expressed as a decimal
- A = ft² of field area served by N (number of emitters)
- F = the design area as a percentage of the field area, expressed as a decimal
- 1.604 = units conversion constant (12 in./ft/7.48 gal./ft.³)

Field application efficiency assumed for design purposes shall not exceed 90 percent.

Capacity. The design capacity of trickle irrigation systems shall be adequate to meet moisture demands during the peak use period of crops to be irrigated in the design area. The capacity shall include an allowance for reasonable water losses during application periods. The system shall have the capacity to apply a stated amount of water to the design area in an 18-hour net operating period. The design area may be less than 100 percent of the field area but not less than the mature crop root zone area.

Design application rate. The design rate of application shall be within a range established by the minimum practical discharge rate of the applicators (orifices, emitters, porous tubing, perforated pipe) and the maximum rate consistent with the intake rate of the soil. The application rate shall be expressed in gallons per hour per emitter or orifice, or per foot of porous tubing or perforated pipe.

The discharge rate of orifices, emitters, porous tubing, or perforated pipe may be determined from the manufacturer's data relating to discharge and operating pressure. Emitters shall be located to provide an overlap of the wetting pattern within the root zone.

Lateral lines. Lateral lines shall be so designed that when operating at the design pressure the discharge rate of any applicator served by the lateral will not exceed a variation of 15 percent of the design discharge rate.

When water supplies are limited, line values installed on each lateral will provide greater versatility in system operation and maintenance.

Main lines. Main lines and submains shall be designed to supply water to all lateral lines at a

flow rate and pressure not less than the minimum design requirements of each lateral line. Adequate pressure shall be provided to overcome friction losses in the pipelines and all appurtenances, such as valves and filters. Main lines and submains shall be designed and installed according to the provisions of the standard for Irrigation Water Conveyance (430).

Filters. A filtration system shall be provided at the system inlet.

If available, recommendations of the emitter manufacturer shall be used in selecting the filtration system. In the absence of the manufacturer's recommendations, the net opening diameter of the filter shall be no larger than one-fourth the diameter of the emitter opening.

All injectors, such as fertilizer injectors, shall be installed upstream of the system filter, except for systems having injectors equipped with separate filters.

The filter system shall permit flushing, cleaning, or replacement as required without introducing contaminants or foreign particles into the trickle system.

To insure proper operating pressure and to detect filter clogging, a pressure gage should be installed on each side of the filter. Pressure regulators should be installed, as needed, to maintain the pressure required.

Other. Accessories (pressure gages, pressure regulators, filters, injectors) should be mounted or secured off of the groove to provide additional protection from breakage and drained to prevent breakage from freezing.

CONSIDERATIONS

Special attention shall be given to maintaining or improving habitat for fish and wildlife. Where wetlands will be affected, the landowner/user will be advised and current NRCS wetland policy will apply, outlined in 190 GM, Subpart B. All provisions of the 1985 Food Security Act will be met where applicable as outlined in the National Food Security Act Manual. All work planned shall be in compliance with General Manual, Title 450-GM, Part 405, Subpart A,

Compliance with Federal, State and Local Laws and Regulations.

Consideration shall be given to the use of construction materials, grading practices, vegetation, and other site development elements that minimize visual impacts and maintain or complement existing landscape uses. All trickle irrigation systems will be planned as part of a resource management system.

PLANS AND SPECIFICATIONS

Plans and specifications for the trickle irrigation system shall be in keeping with this standard and shall describe the requirements for properly

installing the practice to achieve its intended purpose.

3

OPERATION AND MAINTENANCE

An operation and maintenance plan must be prepared for use by the owner or others responsible for operating the system. The plan should provide specific instructions for operating and maintaining the system to insure that it functions properly. It should also provide for periodic inspections and prompt repair or replacement of damaged components.